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ARTICLE

Indigenous knowledge for sustainable development: A case study of Kurmi Mahatos

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Abstract
Indigenous knowledge is considered the invaluable treasure of any particular community. It refers to unique traditional knowledge within a specific geographic area that facilitates indigenous cultural development. Sustainable development is an economically viable, environmentally, and socially beneficial process that balances the present and future communities' needs, for which preservation, promotion, and transmission are the primary requisites. The present study focuses on the Kurmi Mahatos, and their reliance on the traditional methods of using plant and animal species for medical assistance. Indigenous peoples and their knowledge are considered the guardians of the earth, as their conventional practices of medical assistance focus on managing natural resources to the fullest. Their knowledge represents a collection of cultural wisdom for natural resource management, along with the incorporation of caring and respect. Conserving their knowledge of medicinal plants and animals is vital to sustainable development. The S–W–O–C index highlights the chances between resistance and potentiality of this traditional practice.

Keywords Conservation · Indigenous knowledge · Resistance · Resource · Sustainable development · S–W–O–C

1 Introduction

Resources and development are closely related to each other. Each society has its respective knowledge resources, which guide its development process. Local people's age-old knowledge has protected forest resources for years,which is increasingly becoming part of the development agenda (Pandey, 2015). Admixture with other cultures generally brings considerable changes in resource utilization, which even brings massive changes in the developmental process. Indigenous knowledge is a form of wisdom passed down through generations in certain cultures. It is a testament to the ingenuity and resourcefulness of different communities and should be respected and celebrated. By recognizing and valuing indigenous knowledge, we can broaden our perspectives, deepen our understanding, and work towards building a more inclusive and equitable world. Several terms, such as traditional wisdom, folk knowledge, and local knowledge, have restricted this knowledge. These are viewed as the understandings, skills, and philosophies developed by societies. They even provide long histories of human nature relationships. Indigenous knowledge is generally passed from one generation to the other, primarily through cultural rituals, and has been considered the basis for all aspects necessary for sustenance (Berkes, 2009). The sustainable utilization of natural resources mainly characterizes indigenous knowledge. It is generally situational knowledge and is unique to every culture or society. Long-standing traditions and practices are integral to indigenous communities' traditional knowledge. Indigenous knowledge is rooted in Indigenous communities' lived experiences. Apart from formal education, personal observation and daily interactions are vital to passing it on.

It is essential for managing natural resources and empowering communities with problem-solving skills. Society's long-term growth depends on this. The resources are protected by passing down knowledge across generations, which aligns with sustainable development. This cultural knowledge is unacknowledged, and even it is unrecorded. This traditional knowledge of medicinal assistance provides primary healthcare needs to some 80% of the world's population (WHO et al., 1993). As civilizations progress, indigenous wisdom is becoming recognized as an antidote

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to the current rampant route of environmental damage and an alternate road to sustainability. Modern cultural advancement is the reason behind the tragedy of the disappearance of this traditional knowledge. Awareness of sustainable ways of living by the indigenous populations and the deterioration of the planet's conditions may be a remedy for many of the problems caused by various development programs.

The present study discusses the concept of indigenous knowledge and sustainable development. The study further focuses on the linkage between these two through ethnomedicine practices of the Kurmi Mahatos. This age-old tradition of using plants and animals for medical assistance by the Kurmi Mahatos is a significant step towards sustainable development.

2 Indigenous knowledge and sustainable development

The indigenous knowledge of natural resources and ecosystems is far more sophisticated than previous assumptions (Posey, 1995). Many sectors extensively utilize this traditional knowledge. It plays a vital role in the conservation and utilization of natural resources. Such knowledge has been considered the social capital for low-income people (Turner, 2005). Indigenous knowledge has emerged as a treasure trove of valuable and comprehensive wisdom. Nowadays, indigenous knowledge is crucial since it can provide much information about traditional environment management techniques necessary for sustainable development. Traditional knowledge is not an obstacle to development but a step toward modernization (Borthakur & Singh, 2012). Sustainable development depends on intergenerational knowledge transfer in environmental management. It is the holistic traditional scientific knowledge of lands, natural resources, and environment developed over generations. It symbolizes the inter-relationship between the natural environment and the indigenous people concerning cultural, social, economic, and physical well-being. Indigenous people play a pivotal role in biodiversity conservation and environmental resources. They play the primary role in protecting the world's ecological and social diversity. Indigenous people are entirely devoted to their natural habitats. Their land, water, plants, and animals intertwine with their everyday lives. Tribal societies have gained unique knowledge about using wild flora and animals (Damodaran, 2005). As the environmental species are interlinked with their livelihood pattern, this helps preserve them for the future (McDonald et al., 2019; Prakash & Yadav, 2020).

2.1 Indigenous knowledge

Indigenous knowledge is the actual knowledge of a particular section reflecting their experiences based on tradition. It is generally acquired by the local inhabitants and collected through the accumulation of generation-wise experiences (Sraku-Lartey et al., 2017). This knowledge system is indefinite and interlinked with their beliefs. It symbolizes their emotional attachment to nature. Indigenous knowledge is defined differently, but all have acommon focus. Some studies state that the local institutionalized knowledge is transmitted from generation to generation (Ellen & Harris, 1996). Indigenous knowledge is the local knowledge unique to a particular society and frames the cultural identity of that particular social group where it is preserved and operated (Damodaran, 2005). Indigenous knowledge comprises all knowledge confined to a specific section and is transmitted from generation to generation (Kumar, 2010). It forms the information base for a society, which facilitates a society's information base, facilitating communication and decision-making (Flavier, 1995). It is situational and unique to every society's culture and is a 'living process to be absorbed and understood' (Ellen & Harris, 1996; Nemneivah, 2014).

Indigenous groups conceive education as learning for life experience.This knowledge is transmitted through stories, songs, proverbs, cultural values, beliefs, rituals, and local languages. Women and elders play significant roles in indigenous communities (Pandey, 2015). They are considered the custodians of traditional knowledge, culture, and biological diversity (Paul, 2018). This knowledge is confined to any specific field and extended through various fields, namely agricultural, environmental, medicinal, etc. It confirms the preservation of biological resources. This knowledge is the totality of all knowledge and practices established on past experiences and observations people hold and use. It constitutes their collective heritage (Masango, 2010). Indigenous knowledge is considered diverse, and organic ecosystems and healthily relate to the world. Knowledge of various plants and animals makes it the most comprehensive knowledge reservoir. The vast array of plant and animal species is intricately tied to invaluable wisdom. This wisdom has granted us a profound understanding of the natural world and guided us to harmonious coexistence. Preserving and cultivating this knowledge will ensure that future generations can reap the rewards of the astonishing variety of life on our planet. Indigenous knowledge stems from efforts to understand the inter-dependence between the native community and the surrounding flora and fauna (Prakash & Yadav, 2020). It is based on how the particular community relates spiritually and culturally to the plant and animal species. Ecosystems are considered to be the holistic base of this knowledge. It is generally associated with biological resources and even an intangible component.

In 1996, Ellen and Harris delineated ten characteristics of indigenous knowledge. These characteristics are all-encompassing and definitive. The generation of indigenous knowledge begins with the people who reside in the local area. The second method of transmission involves demonstration and imitation. The third step consists of testing it in the unforgiving laboratory of survival. The knowledge is based on scientific investigation rather than practical application. Fifthly, repetition is the bare essential of this kind of knowledge. Sixthly, tradition is the main motto of indigenous knowledge. Seventhly, this concept is dynamic and ever-changing. Although indigenous knowledge may focus on particular individuals, its distribution is always incomplete. Ninthly, indigenous knowledge is directly applicable to functional organization at its densest. Indigenous knowledge is inherently situated within broader cultural traditions, marking its distinctiveness. It is a network of knowledge, beliefs, and traditions. It facilitates preserving, communicating, and contextualizing indigenous relationships with landscape and culture over time. The concept is multi-dimensional. On one hand, it stresses traditions and customs; on the other, it focuses on the knowledge carried from one generation to the other. The term refers to place-based knowledge accumulated and transmitted across generations within specific cultural contexts. Traditional knowledge is a civilizational heritage. Therefore, humans should take the preservation initiative.

2.2 Sustainable development

Sustainable development is an old philosophy revived to cope with new problems. The concept of development stages are tabulated below (Table 1). Sustainability is the goal of 'sustainable development' or 'ecologically sustainable and socially just development' (ESD). It comprises economic and social development types that protect and enhance the natural environment, social equity, and human well-being (Prakash & Yadav, 2020). Care for the environment is essential to economic progress; our planet's natural resources are the basis of all agriculture and industry, and only by sustaining that base can we maintain human development. Sustainable production and consumption practices serve as the base of indigenous knowledge. It further forms the base of the various techniques involved in the conservation and management of resources (Khongsai et al., 2011; Kumar, 2010). Indigenous people ensure food security while conserving the diversity of wild and domestic plants, a significant step towards sustainable development. The spiritual practices involved in the practice of indigenous knowledge help to facilitate a healthy environment, even bringing ecological equilibrium, which helps to prove the concept of sustainability (Sinthumule and Mashau, 2020). Sustainable development refers to maintaining development over time (Paul, 2018).

Table 1 Activities related to the evolution of the concept of sustainable development. *Source* UN (2015), UNEP (2015) and UNDP (2015)

S. no.	Year	Activities with year	Sustainable development
1	1969	Man and his environment report (UN)	Activities for eradication of global environmental degradation
2	1972	World conference on the human environment, (UN and UNEP) Stockholm, Sweden	Slogan 'Only One Earth' was formed
3	1975	Conference on environmental education (UNESCO), Belgrade, Yugoslavia	Belgrade Charter generated
4	1975	International congress of the human environment (Kyoto, Japan)	The same problems were highlighted in Stockholm (1972)
5	1979	World climate conference I (Geneva, Switzerland)	Issues related to climatic change were monitored
6	1981	U.N. conference on least developed countries I (Paris, France)	Assistance to underdeveloped countries
7	1984	United Nations world commission on environment and development	Environmental conservation plans generated
8	1987	Brundtland report	Fundamental principles of sustainable development generated
9	1987	Montreal protocol	Issues related to the Ozone layer are highlighted
10	1990	Second world climate conference (Geneva, Switzerland)	Generation of global climate change monitoring system
11	1992	Earth summit or Rio conference (Rio de Janeiro, Brazil)	Principles of sustainable development developed
12	1997	Conference on climate change, (Kyoto, Japan)	Green house gas emissions monitored
13	2000	Millennium declaration	Millenium development goals set by 2015
14	2002	Sustainable development (Johannesburg, South Africa)	Guidelines for future generated
15	2009	World climate conference III (Geneva, Switzerland)	Monitoring System of Global Climatic Change framed
16	2009	World congress summit G20 (Pittsburgh, USA)	Concept Sustainable Economy framed
17	2012	UN conference Rio+20 (Rio de Janeiro, Brazil)	The concept of a Global Green Economy generated
18	2015	U.N. sustainable development summit 2015 (New York, SAD)	17 millenium development Goals by 2020
19	2015	Climate change conference (Paris, France)	Limitation of global warming

Sustainable development meets the needs of the present generation without compromising future generations' ability to meet their own needs. In a sustainable society, people's ability to do what they have good reason to value is continually enhanced. Sustainable development is the continuous process of social change accepted worldwide. Its main aim is to secure the prerequisites of a good life for the present and future generations. It deals not solely with environmental matters and nature's carrying capacity. Despite this, it requires environment, man, and economy in equal accentuation for decision-making and implementation. Sustainability brings up environmentally aware citizens who can build up ecologically, economically, socially, and culturally sustainable future.

3 The linkage between indigenous knowledge and sustainable development

Ecological history has reflected the relationship between man and nature, demarcating environmental consciousness. It has opened up new dimensions in our understanding of man-nature relationships.The history of humanity and the environment has earned immense significance in various literatures. This approach reflects the theory of the dialectical relationship between man and his surroundings (Pandey, 2015; Paul, 2018). Madhav Gadgil and Ramachandra Guha were considered the proponents of the study of man-environment relationship from a historical perspective. This study was completely different from all previous domains. Examples are noted in the essays *Nature*, *Culture*, and *Imperialism* by David Arnold and Ramachandra Guha and *Nature and the Orient* by Richard Grove, Vinita Damodaran, and Satpal Sangawan. These two explored the importance of natural resources as an example of indigeneity. Historians studying forest ecology criticized colonial policies. The emergence of the colonial period created a deprivation of indigenous knowledge. The colonial intervention deprived the indigenous community of traditional practices. Colonialism, according to historians, destroyed the pre-colonial nature. Human-environmental relationships immensely influence cultural identities (Mahato, 2020).

Biological diversity and sustainable utilization of resources are crucial for ecosystem stability and human survival. Several indigenous communities follow several environmental conservation practices based on their religious beliefs. This is a tradition of environmental conservation (Pandey, 2015). The importance of indigenous knowledge systems in conserving natural resources is noteworthy. They are considered the oldest remedies for humanity. Indigenous knowledge was first formally discussed at "Rio" conference on sustainable development. Several works reflect the mutual balance between man and his local environment owing to indigenous knowledge systems. Indigenous knowledge is a dynamic, complex, and practical system of scientific validity (Naik, 2019). These forms of knowledge, deeply rooted in their relationships with the environment and cultural cohesion,facilitated sustainable use of natural resources. Indigenous knowledge replicates respective communities' ever-changing creative thought and action. This knowledge earns an immense place in the study of sustainability in the context of climatic crisis. The strong contextual and cultural connections make indigenous knowledge an essential part of the lives of the indigenous peoples as it provides significant prerequisites for surveillance. Indigenous knowledge within its socio-cultural context leads to sustainable development. There is no single route for sustainable development, but this traditional knowledge is a major one. Indigenous peoples have a moral perspective about the earth that prescribes them to act non-destructively toward everything. It indicates the linkage and relevance to conservation and sustainable development, including respect towards nature (Harvey, 2009; Muehlebach, 2001). Overexploitation of resources is to be restricted. The responsibility of every individual is a significant prerequisite for preserving this for future generations (Dewalt, 1994).

4 Glimpses from the practices of Kurmi Mahatos

India reflects a rich, vibrant, and diverse cultural history, and a large-scale health-healing-related knowledge base is present in all ethnic communities across the various ecosystems (Panor et al., 2020; Prakash & Verma, 2021; Sinthumule and Mashau, 2020). Since time immemorial, various traditional societies played a pivotal role in conserving India's biodiversity across a broad spectrum of habitats, ranging from tropical rainforests to alpine vegetation and coastal wetlands (Kumar, 2010).The linkage between indigenous knowledge and sustainable development is reflected in the Kurmi Mahatos' usage of plant and animal species for medicinal purposes. This traditional knowledge is known as ethnomedicine. The indigenous community still relies on this for therapeutic purposes, but due to the advocacy of modern drugs, the dependency on ethnomedicine has declined. The present study has been conducted among the Kurmi Mahatos, especially in the villages where the practice of ethnomedicine persists.

4.1 Kurmi Mahatos

Tribes live apart from the world's mainstream and are isolated from modern influences. Numerous tribes reside all over India and in several parts of the world. More than

55% of India's tribal population dwells in central India, comprising Bihar, West Bengal, Orissa, and Madhya Pradesh. It is worth noting that the remaining tribal populations are highly concentrated in the Himalayan belt, Western India, the Dravidian area, and the Andaman, Nicobar, and Lakshadweep islands, culminating in a highly diverse and vibrant cultural landscape. Society underwent a massive transformation in post-independent and post-colonial India due to worldwide interactions and the information revolution. Around 90 million people in India are members of indigenous communities known as *adivasi* or tribal. The 2011 Census states that India has 8.10% of the tribal population. The Kurmi Mahatos are the most crucial agriculturist community in eastern India. Ethnographers mainly identified their differences from other communities (Damodaran, 2006). Literature reflects that the term 'kurmi' has been derived from 'kutumbin'. Their reflections are found in the inscriptions from the Gupta period. They were considered the earliest settlers among the aboriginals (Chatterjee, 2008). They mainly reside in Jharkhand, part of West Bengal, and Orissa. In Orissa, they are prominent in Mayurbhanj and Keonjhar. In West Bengal, they are concentrated throughout Jangalmahal's Jhargram, Purulia, Paschim Medinipur, and Bankura. But later, some migrated to other parts of West Bengal, Orissa, Assam, and even Bangladesh to seek employment.

4.2 Ethnomedicine

Ethno medicine is the study of the preparation of medicines obtained from plants and animals mainly prepared by the indigenous group, especially those with little access to Western medicines. Plants are important sources of therapeutic drugs that play a significant role in the survival of various tribal and ethnic communities (Arya et al., 2020; Prakash & Verma, 2021). Traditional medicine is generally the sum of knowledge, skills, and practices based on the theories, beliefs, and experiences indigenous to different cultures used to maintain health, prevent diseases, and improve physical and mental illness (Bodding, 1925). It is "traditional" as created in such a manner that reflects the traditions of the communities, not relating to the nature of the knowledge itself, but is related to the way of creation, preservation, and dissemination (Arya et al., 2020). Traditional medical practices are the study of various cultures along with approaches to health, disease, illness, and the local healing system. Medical systems are considered an integral part of the cultural attributes of that particular community. These forest products, mainly used by various tribal people for resolving different purposes, play a prominent role in securing and sustaining their economy, health, and culture. These practices performed by most indigenous communities residing in remote parts are considered a boundless traditional knowledge of the community (Mukherjee & Wahile, 2006). Exploring, utilizing, and restoring these resources is necessary to preserve indigenous knowledge, develop the economy, and maintaine cological sustainability. Traditional healers center this conventional knowledge system around the person, such as a man or woman. The traditional healers are the guiding light of the entire community (Shankaret al., 2012). Their society is a complex web where the economy, religion, politics, knowledge systems, and ecology are interdependent. The tribal people depend on plants and plant products for their daily lives. They mainly depend on traditional herbal medicine suggested by traditional medicine men or traditional health practitioners for their medical assistance (Prakash & Yadav, 2020). Traditional medicines and natural products have made fruitful contributions to the preparations of modern medicine. While preparing new drugs, both natural products and traditional medicines have incomparable advantages, such as abundant clinical experiences and their unique diversity of chemical structures and biological activities. Indigenous knowledge systems have earned considerable attention in the recent past. It further includes the components of ethnomedicine, the importance of combining ethnomedicine and bio-sciences, and the bio-cultural nature of ethnomedicine.

Ancient India is renowned for its advancements in medical plant practices, which researchers have extensively explored and studied throughout the nation. India's health-care system is rooted in a rich tradition of medicinal plants. India is one of the twelve mega-biodiversity countries of the world, with rich vegetation, a wide variety of medicinal plants, and plant-based knowledge distributed amongst many ethnic groups (Biswakarma et al., 2017). *Purāṇas* provide evidence of the long-standing practice of studying forest species for medicinal benefits, reflecting their ethnomedical usage. Different cultures view these as divine blessings. Herbal plants are divine indications intended for healing (Kumar, 2010). Vedic literature even specifies the importance of ethnomedicine. *Ṛgveda* (1400–1800 BCE) is the oldest medicinal plant repository. The Greeks and Romans acknowledged medicinal herbs along with their therapeutics. *Ṛgveda* helped identify medicinal plants' potentialities (Pie, 1995). The works of Aristotle (384–322 BCE), Theophrastus (370–287 BCE), Pliny the Elder (29–79 CE), Dioscorides (50–100 CE), and Galan (131–201 CE), are a rich repository of medicinal knowledge. Ruins of Mohenjo-Daro and Harappa fossils even highlight the presence of forest species for medical assistance. John Fleming wrote a book entitled *Catalog of Medicinal Plants* in 1810. The *Materia Medica* (1813), an annotated ancient Indian book on ethnomedicine, provides significant information related to therapeutic information against different chronic diseases. *Indigenous Drugs of India*, by R. N. Chopra, is another significant contribution.

Table 2 Health issues addressed by different tribes as reflected in various literature

Sl no.	Ailments	Tribes and their place of dwelling	References
1	Headache, body ache	Gond, Chanchu, (Telangana) Gujjar, Bakarwala (Jammu and Kashmir)	Shah et al. (2015) and Singh (2018)
2	Eye infections, conjunctivitis	Pangawal (Himachal Pradesh), Kani (Kerala)	Purushothaman and Irfana Mol (2020)
3	Asthma, cough and cold, fever, rhinitis, throat infection	Andamanese (Andaman and Nicobar Island), Baiga (Madhya Pradesh), Bhil (Rajasthan), Birhor (Chattisgarh), Chorei (Assam), Dungari, Garasia (Gujarat)	Ahirwar (2017), Katewa et al. (2004), Ekka and Dixit (2007), Chowdhury et al. (2012), Gibji et al. (2012) and Singh (2018)
4	Abdominal pain, chlorea, diarrhea, dysentery, gastrointestinal infections, indigestion, jaundice	Gond, Chanchu (Telangana), Gujjar, Bakarwala (Jammu and Kashmir), Gurung (West Bengal), Kani (Kerala), Lepcha (Sikkim), Phom-Naga, Santal, Kol, Bhomij, Kharia, Gonds (West Bengal), Oraon (Jharkhand)	Shah et al. (2015), Palit and Gurung (2008), Purushothaman and Irfana Mol (2020), Pradhan and Badola (2008), Imchen and Jamir (2011), Rout et al. (2009)
5	Arthritis, bone fracture, Joint pain	Gond, Chanchu (Telangana), Santal, Kol, Bhomij, Kharia, Gonds (West Bengal), Oraon (Jharkhand), Pangawal (Himachal Pradesh)	Rout et al.(2009), Singh (2018)
6	Malaria, typhoid	Khamti (Arunachal Pradesh), Phom-Naga	Imchen and Jamir (2011)
7	Anaemia, blood pressure, diabetes, epilepsy, kidney disorder, paralysis, polio, skin disease, ulcer, urinary disorder	Baiga (Madhya Pradesh), Birhor (Chattisgarh), Buddhist (Ladakh), Gond, Chanchu (Telangana), Khamti (Arunachal Pradesh), Santal, Kol, Bhomij, Kharia, Gonds (West Bengal), Oraon (Jharkhand)	Ahirwar (2017), Ekka and Dixit (2007), Ballabh and Chaurasia (2007) and Rout et al.(2009)
8	Ratbite, snake bite, dog bite	Bhil (Rajasthan), Dungari, Garasia (Gujarat), Oraon (Jharkhand)	Katewa et al. (2004), Gibji et al. (2012), Punjani and Pandey (2015), Singh (2018)

Even *Rāmāyana* and *Mahābhārata* provide evidence of using plants for medical assistance. The concept of traditional medical practices has earned huge concern in several literatures. Several pieces of literature reflect the study of medicinal plants by various tribal communities, the parts used, and the ailments for which they are used by multiple tribal communities (Table 2).

Herbal medicinal preparations contain effective antimicrobial and active antiseptic compounds and have wound-healing and regenerative properties. Generally, the ingredients essential for the preparation of medicines are available from the forest. This knowledge is significant, and preservation is necessary for future generations (Khasim, 2020). Plants play a prominent role not only in the preparation of traditional medicine but also in the preparation of modern drugs, which is noteworthy. Since time immemorial, humans have utilized plants as a source of medicine by indigenous people of different ethnic groups inhabiting various terrains. But presently, not only the medicinal plants but their associated traditional knowledge is threatened owing to natural and anthropogenic factors. Urgent investigations and subsequent conservation measures are the primary requirements to save these resources from further loss. Accessibility to modern medicines and the young generations' minor concerns threaten this traditional knowledge's existence. Thus, conservation is a primary requisite in the present scenario (Khongsai et al., 2011). Various methods have been used to prepare multiple drugs (Hsu, 2010; Khongsai et al., 2011; Mukherjee et al., 2016). The usage sometimes provides diverse impacts (Lee et al., 2016). Even oral transmission is unacceptable because this knowledge is lost with the death of ethnomedical men (Mahapatra et al. 2019). Studies even reflected the various debates regarding this concept (Damodaran, 2006). The introduction of allopathic medication is the primary reason behind the negligence of this age-old practice (Saikat et al., 2016). After reviewing the literature, it is evident that very little work has been done focusing on the Kurmi Mahatos regarding their practice of ethnomedicine and the role of this practice in sustainable development. This work is an attempt to fill that gap.

4.3 Usage of ethnomedicine and sustainable development

India has a rich heritage of traditional medical systems and is considered the most crucial country in the world regarding floristic diversity (Prakash & Verma, 2021). Since the dawn of civilization, medicinal plants have been used in the human health sector. This knowledge of the utilization of medicinal plants plays a significant role among various ethnic communities. It has earned considerable attention in the scientific community and has even become a major topic of global importance (Ayyanar, 2012). The dependency of ethnic communities on natural resources is noted worldwide, and the usage of plant species as traditional therapeutics offers a natural alternative in the field of healthcare

Table 3 Medicinal plants and their usage. *Source* Field Survey, 2023

Sl. no.	Scientific name	Local name	Parts used	Ailments treated/health benefits
1	*Calotropis procera* (*Aiton*) *W.T. Aiton*	Akanda	Latex	Digestive disorders septic wounds
2	*Curcuma amada* Roxb.	Amada	Rhizome	Asthma and bronchitis
3	*Phyllanthus emblica* L.	Amlaki	Fruit	Ulcer, liver function, improves immunity, clears opaqueness
4	*Hemidesmus indicus* (L.) R.Br	Anantamul	Root	Skin diseases
5	*Achyranthes aspera* L.	Apang	Whole plant	Body pain
6	*Terminalia arjuna* (Roxb.)Wight & Arn	Arjun	Bark	Used in atherosclerosis and cardiomyopathy
7	*Withania somnifera* (Linn.)	Ashwagandha	Root	Accelerates the growth of children, antibacterial property
8	*Acacia Arabica*	Babla	Gum	Diarrhea
9	*Acacia nilotica* (L.) Wild exDelile	Babul	Bark	Diarrhea
10	*Terminalia belliricia* (Gaertn.) Roxb.	Bahera	Fruit	Cough & cold, constipation, improves immunity
11	*Aegle marmelos* Corr.exRoxb	Bel	Leaf, Root, Fruit	Fever, tuberculosis, constipation
12	*Kaempferia galanga* Linn	Bhuichampa	Timber	Fever, weakness, piles
13	*Tephrosia purpurea* (L.) Piers	Bon nil	Root, Stem	Liver cirrhosis, fever
14	*Bacopa monnieri* (L.)	Brahmi	Whole plant	Increases memory
15	*Alstonia scholaris* (L.) R. Br	Chatim	Latex	Chest pain
16	*Datur ametel* L	Dhutra	Seed	Poisonous chemical
17	*Ficus hispida*	Dumur	Fruit	Ulcer, vomiting
18	*Cynodon dactylon*	Durba	Leaf	Injury, dysentery
19	*Aloe vera*	Ghritokumari	Leaf	Digestion, wounds
20	*Tinospora cordifolia* (Willd)	Gulancha	Stem	Jaundice and diabetes
21	*Curcuma longa* L.	Haldi	Rhizome	Digestive disorder
22	*Terminalia chebula* Retz	Haritaki	Fruit, Stem	Gastritis, boosts immunity
23	*Heliotropium indicum* L.	Hatisur	Leaf	Typhoid fever
24	*Enhydra fluctuans* Lour	Hinchey	Whole plant	Dysentery, Inflammation, Skin diseases
25	*Andrographis paniculata* (Burm.f.) Nees	Kalmegh	Leaf	Used as anthelmintic
26	*Syzygium cumini* (L.) Skeels	Kalo jam	Bark, seed	Useful in dysentery, treating diabetes
27	*Buettneria herbacea* Roxb.	Kamraj	Root	Swelling of legs, cholera, diarrhea
28	*Bauhinia acuminata* L.	Kanchan	Leaf	Malarial fever
29	*Barleria lupulina* Lindl	Kantabishalyakarani	Leaf	Breathing, pain
30	*Diopyros melanoxylon* Roxb.	Kendu	Leaf, Root, Bark	Scabies, stomach disorders
31	*Hygrophila articulate* Schumach	Kulekhara	Leaf	Anaemia
32	*Holarrhena pubescens* Wall. ex G. Don	Kurchi	Bark	Diarrhea
33	*Schleichera oleosa* (Lour.) Oken	Kusum	Fruit, bark	Skin diseases
34	*Cymbopogon schoenanthus* (L.) Spreng	Lemon grass	Leaf	Treating rheumatism, Stomach ache
35	*Trigonella foenum-graecum*	Methi	Seeds	Diabetes
36	*Madhuca longifolia* (Koenig) Macbride	Mohua	Flower, bark	Cardiac diseases, dental problems, skin diseases
37	*Acalypha indica* L.	Muktojhuri	Leave	Insect bite
38	*Azadirachta indica* A. Juss	Neem	Leaf, fruit	Leaves are used to treat ringworms, leprosy, and fruit in eye disorders
39	*Catharanthus roseus* (L.) G.Don	Nayantara	Leaf	Cancerous wounds
40	*Butea monosperma* (O. Kuntz) Taub	Palash	Flower, leaf	Diarrhea, anthelmintic, diabetes
41	*Bryophyllum pinnatum* (Lam.) Kurz	Patharkuchi	Leaf	Diarrhea
42	*Carica papaya*	Penpe	Leaf, fruit	Dengue
43	*Pterocarpus marsupium* Roxb.	Piyasal	Bark, Latex	Diabetes
44	*Rauvolfia serpentina* Benth.ex.Kurz	Sarpagandha	Rhizome	Snake bite
45	*Asparagus racemosus*Willd	Shatamuli	Root	Dyspepsia, diabetes, improves female reproductive health
46	*Oroxylum indicum* (L.) Benth. ex Kurz	Shonak	Bark	Allergy
47	*Centella asiatica* L.	Thankuni	Leaf	Dysentery, diarrhoea, amoebiasis
48	*Ocimum tenuiflorum* L.	Tulshi	Leaf	Cough, insect bites

Table 3 (continued)

Sl. no.	Scientific name	Local name	Parts used	Ailments treated/health benefits
49	*Justicia adhatoda* L.	Vasak	Leaf	Cough, asthma, bronchitis

worldwide (Ekor, 2014; Hayta et al., 2014; Mahmoodally et al. 2018; Debnath et al., 2019). Each community's medical assistance is the basis for their culture's medicinal common sense or logic (Panor et al., 2020; Quinlan, 2011). The cultural significance lies within the respective community (Sinthumule and Mashau 2020; Waheed et al. 2020). The Kurmi Mahatos generally use various plant species for medical assistance (Table 3).

Plants' bark, flowers, leaves, fruits, roots, rhizomes, seeds, shoots, tubers, resins, and woods are all used in traditional medicine.The most repeatedly used plant part is its leaf, followed by stem and bark, both of root, fruit, seed, and flower. These are used to treat various respiratory tract infections, including asthma, cold, cough, fever, headache, etc., followed by diarrhea and infection, diabetes followed by joint pain and fractures, burns, anemia, wound healing, stomach upset, inflammation, and snakebite. Other uses are to cure jaundice, worm infections, dental problems, etc. These plants are also crucial as tonic, astringent, insecticide, antidote, etc. This traditional medical knowledge does not require special training to practice. Almost all the members of the ethnomedical family are aware of these herbal remedies. These medicines are natural, and the raw materials for the preparation of these medicines are easily accessible. Even these medicines have no side effects and are also cost-effective.

Moreover, the people have enough faith in these medicines. The ethnomedical men are the leading suppliers of this medicine. This knowledge is generally transmitted from one generation to the other.This age-old tradition helps preserve various resources.The linkage between this cultural heritage and the surrounding environment is essential.

The indigenous medicinal process,which evolved over a long period of history, attempts not to cure but to heal the mind and body of the recipient. Every community member plays a significant role in maintaining the whole community, which plays a unique role in perpetuating the system (Ayyanar, 2012; Debnath et al., 2019; Sinthumule & Mashau, 2020). Indigenous knowledge is related to the sustenance and survival of humankind worldwide. This invaluable treasure facilitates the information base of any society and is carried through generations. Kurmi Mahatos utilizes this traditional knowledge in various livelihood sectors, which is a step towards sustainable development. This knowledge helps them to tackle multiple problems in an eco-friendly manner. This is highly loaded within the value system and norms of the community.

The Kurmi Mahatos generally depend on the forest for their survival. The forest's wealth offers them protection against various aspects. Their knowledge of using forest species against various ailments is culturally supportive, economically viable, and environmentally sustainable. Their practices of ethnomedicine facilitate healthy lives and maintain well-being. It promotes sustainable development by regulating biodiversity and habitat loss. Traditional knowledge of medical assistance by this community has provided equitable opportunities as it works at the grassroots level, facilitating sustainable development. The utilization of forest medical aid species reflects their proximity towards nature, which is vital for sustainable development as it ties past and the future. This helps individuals to learn how to live in the environment sustainably. The study illustrates that the use of ethnomedicine by the Kurmi Mahatos is presently at stake for various reasons, as discussed above. However, the preservation of this is a crucial requisite not only for the present but also for future generations.

The above discussion illustrates the Indigenous Knowledge of the Kurmi Mahatos, their implications, and their role in facilitating sustenance. This practice is culturally integrated, economically practical, community-centric, nature-oriented, and stable, which helps in the well-being and proper utilization of resources. This helps build peace within the society, which is a significant attempt to live sustainably. The practice of ethnomedicine earns prominent significance among the members of this community. Still, the exploitation of resources due to the emergence of modern civilization has led to the extinction of plant species, which creates significant problems in the preparation of medicines. Admixture of this de-tribalized section with modern culture has brought considerable changes in the livelihood pattern, which, on the other hand, has brought immense change in the utilization of this traditional mode of medical assistance. They are aware of this medical assistance, but its usage has declined. The young generation is inclined towards modern medical practices because they believe that traditional methods are unsuitable for curing deadly diseases. This paved the path of declination in the usage of this practice. Even the traditional healers have stopped their practice. But, the preservation of this traditional practice is essential for the future.

Table 4 S–W–O–C analysis. *Source* Field Survey, 2023

Indicators	Grade on 5 point Scale	Scale	Dimension specific index	SWOC Index in %
Strength				
Easy availability	5	21	Strength specific index (SSI) 4.2	50
Cost-effective	5			
Absence of side effects	4			
Effective	3			
Trial and error method for preparation	4			
Weakness				
Absence of specific dosage	4	23	Weakness specific index (WSI) 4.6	
Time-consuming regarding cure	4			
Not practical for deadly diseases	5			
Absence of preservation facility	5			
Not tested in laboratory	5			
Opportunities				
The trend toward modern methods	3	19	Opportunity specific index (OSI) 3.8	
Traditional knowledge	5			
Optimum utilization of resources	5			
Enhancement of awareness	3			
Tourism	3			
Challenges				
Extinction of species	5	20	Challenges specific index (CSI) 4.0	
Lack of infrastructural facilities	4			
Absence of Govt support	5			
Inclination towards modern drugs	3			
Decrease in faith	3			

5 S–W–O–C analysis (strength-weakness-opportunity-challenges)

An S–W–O–C analysis is considered an authoritative strategic planning tool used to determine the merits and demerits of any qualitative socio-cultural study (Aithal & Kumar, 2015). In this analysis, the strengths and opportunities highlight the positive aspects; however, weaknesses and challenges reflect the negative aspects of the issue being considered. A consistent study in and out of the environment will pave the path to adequately utilizing resources and facilitating sustainable development. This SWOC index analysis helps assess the potentiality and prospect of ethnomedicinal practice by indigenous people of the study area to sustain the economy and ecology against the existing resistance and challenges persisting there (Table 4).

5.1 Strengths

The study reflects the various strengths of the practice of ethnomedicine by the respondents of the concerned area.The significant strengths include easy availability and minimal side effects. The cost-effectiveness of the practice makes it affordable for them.They are even prepared through trial-and-error methods.

5.2 Weaknesses

The study highlights various weaknesses of the practice of ethnomedicine, such as the absence of preservation methods and specific dosage. They are less effective for deadly diseases. Both of these reflect a very high magnitude of responses. These are the major causes behind the limited use of this traditional practice and the inclination towards modern drugs.

5.3 Opportunities

This study shows that traditional medicine plays a significant role in meeting the primary healthcare needs of ethnic communities in the event of limited access to modern healthcare facilities. Awareness generation and enhancement of financial and infrastructural support are the significant aspects that require the utmost importance to keep this mode in practice.

5.4 Challenges

The challenges have a large-scale impact on the future of this practice, as reflected by the lack of infrastructure and governmental initiatives. No single endeavour has been undertaken to preserve the species required to prepare various ethnomedical drugs. This age-old practice, acquired from the intermingling experience with ecological settings, is presently under threat owing to the negligence of governmental efforts. If these could be overcome,it would facilitate the sustenance of this traditional knowledge and the preservation of biodiversity and ecological sustainability at a large scale.

The overall SSI and OSI are 4.2 and 3.8, which indicates the considerable potentiality of these traditional practices, and the WSI and CSI are 4.6 and 4.0, which states that the momentum of the strength and opportunity are the same. The S–W–O–C index reflects a scenario between resistance and potentiality. The traditional healing system faces a challenging journey that one must overcome. Except for a few cases, this indigenous knowledge system of traditional medicine is appropriately validated and culturally accepted by the indigenous people of the study areas. This practice is not only very economical for the poor tribal people of remote forest villages but also the means of livelihood of many ethnomedicinal families. The surrounding forest areas supply raw materials for the preparation of medicines. They are keen to protect the forest to prevent the extinction of species by outsiders for commercial purposes. Therefore, sustainable development would be maintained if this traditional knowledge were preserved by humankind. This knowledge is essential for conserving natural resources, protecting the environment, and promoting sustainable livelihoods. It can also create new markets for traditional products and opportunities for indigenous communities.

6 Conclusion

The present study clearly states that the Kurmi Mahatos depend on indigenous knowledge for their medical assistance. This practice of ethnomedicine is nature-supportive and eco-friendly. Their traditional methods are relevant to all spheres of sustainable development, including social, economic, and environmental. This study highlights that this community generally depends on forest species for their medical assistance. The various parts of the plants are used for the preparation of medicines. These are mainly used to treat multiple diseases, including respiratory tract infections, diarrhea and infection, diabetes, joint pain and fractures, burns, anemia, wound healing, stomach upset, inflammation, snakebite, etc. These are advantageous owing to their cost-effectiveness, easy availability of raw materials to prepare these drugs, and fewer side effects. No such training is required for the preparation of these kinds of medicines. The traditional healers, the ethnomedical men, are the leading suppliers of this kind of medicine.

Data availability This study is based on primary survey. Hence the sources are mentioned in respective sections.

Declarations

Conflict of interest The author reported no potential conflict of interest.

Ethical approval The interest of the study lies in exploring the indigenous knowledge of the Kurmi Mahatos regarding the usage of medicinal plants and animals. This is a primary step towards the attainment of sustainable development.

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